

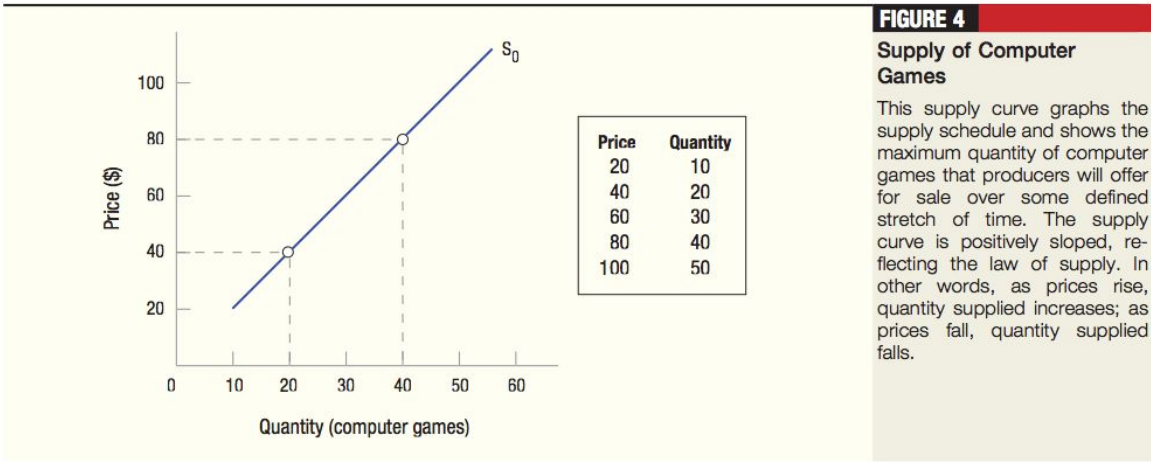
The Supply Curve

Just as demand curves graphically display the law of demand, **supply curves** provide a graphical representation of the law of supply. The supply curve shows the maximum amounts of a product a producer will furnish at various prices during a given period of time. While the demand curve slopes down and to the right, the supply curve slopes up and to the right.² This illustrates the positive relationship between price and quantity supplied: the higher the price, the greater the quantity supplied.

Supply curve
Supply schedule information translated to a graph.

Market Supply Curves

As with demand, economists are more interested in market supply than in the supplies offered by individual firms. To compute market supply, you use the same method used to calculate market demand, horizontally summing the supplies of individual producers. A hypothetical market supply curve for computer games is depicted in Figure 4.



Determinants of Supply

Like demand, several factors other than price help to determine the quantity of a product supplied. Specifically, there are six **determinants of supply**: (1) production technology, (2) costs of resources, (3) prices of other commodities, (4) expectations, (5) the number of sellers (producers) in the market, and (6) taxes and subsidies.

Determinants of supply
Other nonprice factors that affect supply including production technology, costs of resources, prices of other commodities, expectations, number of sellers, and taxes and subsidies.

Production Technology

Technology determines how much output can be produced from given quantities of resources. If a factory's equipment is old and can turn out only 50 units of output per hour, then no matter how many other resources are employed, those 50 units are the most the factory can produce in an hour. If the factory is outfitted with newer, more advanced equipment, however, capable of turning out 100 units per hour, the firm can supply more of its product at the same price as before, or often even at a lower price.

Technology further determines the nature of products that can be supplied to the market. A hundred years ago, the supply of computers on the market was zero,

²There are some exceptions to positively sloping supply curves. But for our purposes, we will ignore them for now.

because computers did not yet exist. More recent advances in microprocessing and miniaturization brought a wide array of products not available just a few years ago to the market, including MP3 players, auto engines that go 100,000 miles between tune-ups, and constant monitoring insulin pumps that automatically keep a diabetic patient's glucose levels under control.

Costs of Resources

Resource costs clearly affect production costs and supply. If resources such as raw material or labor become more expensive, production costs will rise and supply will be reduced; the reverse is true if resource costs drop. The growing power of microchips along with their falling cost has resulted in cheap and plentiful electronics and microcomputers. Nanotechnology—manufacturing processes that fashion new products through the combination of individual atoms—may soon usher in a whole new generation of inexpensive products made from atoms of sand, an obviously cheap and plentiful resource. Some futurists even suggest that nanotechnology will one day end scarcity as we know it. (What would economists do then?)

On the other hand, if the cost of petroleum goes up, the cost of products using petroleum in their manufacture will go up, leading to the supply being reduced. If labor costs rise because immigration is restricted, this drives up production costs of California vegetables (fewer farm workers) and software in Silicon Valley (fewer software engineers from abroad) and leads to a decrease in supply.

Prices of Other Commodities

Most firms have some flexibility in the portfolio of goods they produce. A vegetable farmer, for example, might be able to grow celery, radishes, or some combination of the two. Given this flexibility, a change in the price of one item may influence the quantity of other items brought to market. If the price of celery should rise, for instance, most farmers will start growing more celery. And since they all have a limited amount of land on which to grow vegetables, this reduces the quantity of radishes they can produce. Hence, in this case, the rise in the price of celery may well cause a reduction in the supply of radishes brought to market.

Expectations

The effects of future expectations on market supplies can be complicated, and it is often difficult to generalize about how future supplies will be affected. When producers expect the prices of their goods to rise in the near future, they may react by increasing production immediately, causing current supply to increase. Yet, expectations of price cuts can also temporarily increase the supply of goods on the market as producers try to sell off their inventories before the price cuts hit. In this case, it is only over the long term that price reductions result in supply reductions, as we would expect.

Number of Sellers

Everything else being held constant, if the number of sellers in a particular market increases, the market supply of their product increases. It is no great mystery why: 10 shoemakers can produce more shoes in a given period than five shoemakers.

Taxes and Subsidies

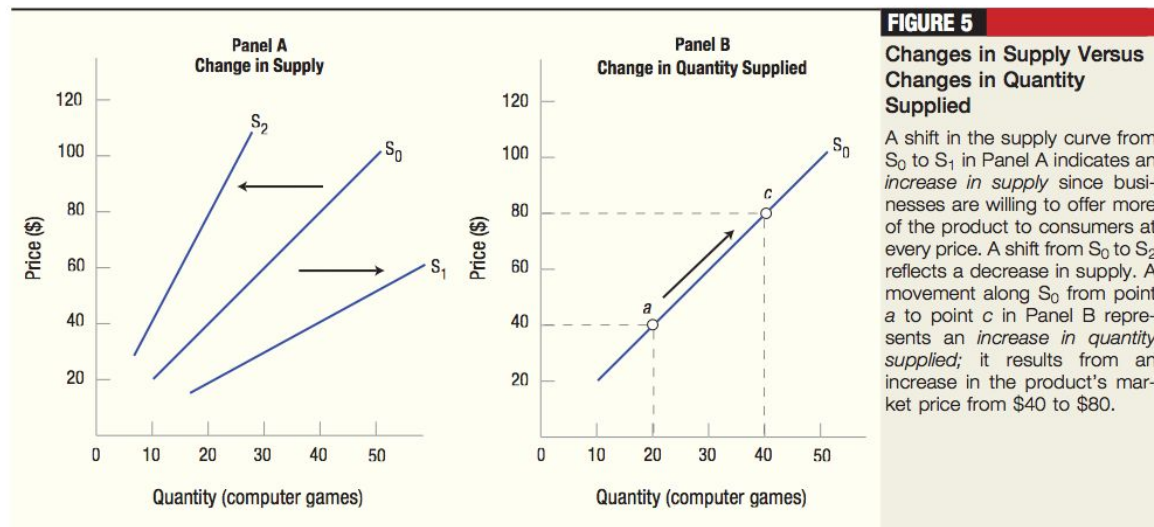
To business, taxes and subsidies are costs. An increase in taxes (property, excise, or other fees) will reduce supply. Subsidies are the opposite of taxes. If the government subsidizes the production of a product, supply will rise. A luxury tax on power boats in the 1990s reduced supply (the tax was the equivalent of an increase in production costs), while today's subsidies to ethanol producers are expanding production.

Changes in Supply Versus Changes in Quantity Supplied

A **change in supply** results from a change in one or more of the determinants of supply; it causes the entire supply curve to shift. An increase in supply of a product, perhaps because advancing technology has made it cheaper to produce, means that more of the commodity will be offered for sale at every price. This causes the supply curve to shift to the right, as illustrated in Panel A of Figure 5 by the shift from S_0 to S_1 . A decrease in supply, conversely, shifts the supply curve to the left, since fewer units of the product are offered at every price. Such a decrease in supply is here represented by the shift from S_0 to S_2 .

Change in supply

Occurs when one or more of the determinants of supply change, shown as a shift in the entire supply curve.



A change in supply involves a shift of the entire supply curve. In contrast, the supply curve does not move when there is a **change in quantity supplied**. Only a change in the price of a product can cause a change in the quantity supplied; hence, it involves a movement along an existing supply curve rather than a shift to an entirely different curve. In Panel B of Figure 5, for instance, an increase in price from \$40 to \$80 results in an increase in quantity supplied from 20 to 40 games, represented by the movement from point a to point c along S_0 .

Change in quantity supplied

Occurs when the price of the product changes, and is shown as a movement along an existing supply curve.

In summary, a change in supply is represented in Panel A by the shift from S_0 to S_1 or S_2 , and this involves a shift in the entire supply curve. A change in quantity supplied is shown in Panel B and is a movement along an existing supply curve caused by a change in price of the product.

As on the demand side, this distinction between change in supply and change in quantity supplied is crucial. It means that when a product's price changes, only quantity supplied changes—the supply curve does not move.

Checkpoint

Supply

REVIEW

- Supply is the quantity of a product producers are willing and able to put on the market at various prices, all other relevant factors being held constant.

- The law of supply reflects the positive relationship between price and quantity supplied: the higher the market price, the more goods supplied, and the lower the market price, the fewer goods supplied.
- As with demand, market supply is arrived at by horizontally summing the individual supplies of all of the firms in the market.
- A change in supply occurs when one or more of the determinants of supply change.
- The determinants of supply are production technology, the cost of resources, prices of other commodities, expectations, the numbers of sellers or producers in the market, and taxes and subsidies.
- A *change in supply* is a shift in the supply curve. A shift to the right reflects an increase in supply, while a shift to the left represents a decrease in supply.
- A *change in quantity supplied* is only caused by a change in the price of the product; it results in a movement along the existing supply curve.

QUESTION

What has been the impact of the iPod, iTunes, and MP3 players in general on high-end stereo equipment production?

Answers to the Checkpoint question can be found at the end of this chapter.

Market Equilibrium

Before considering the concept of market equilibrium, let's take a quick look back at what we've covered so far. Demand and supply are both relationships between the price and quantity of some product over a given period of time, all other determinants being held constant. The quantity of a product supplied or demanded changes only when the product's price changes. Accordingly, changes in quantity supplied and quantity demanded cause movements along supply curves and demand curves, respectively. When one or more of the determinants of supply or demand changes, however, the curves themselves shift. This leads to more or less of the product being supplied or demanded at the current price. A summary of how the determinants impact both supply and demand is shown in Figure 6. You will find this a good reference when solving problems where supply and demand change.

Supply and demand together determine the prices and quantities of goods bought and sold. Neither factor alone is sufficient to determine price and quantity; it is through their interaction that supply and demand do their work, just as two blades of a scissors are required to cut paper.

A market will determine the price at which the quantity of a product demanded is equal to the quantity supplied. At this price, the market is said to be cleared or to be in **equilibrium**, meaning the amount of the product that consumers are willing and able to purchase is matched exactly by the amount that producers are willing and able to sell. This is the **equilibrium price** and the **equilibrium quantity**. The equilibrium price is also called the market-clearing price.

Figure 7 puts together Figures 2 and 4, showing the market supply and demand for computer games. It illustrates how supply and demand interact to determine equilibrium price and quantity. Clearly, the quantities demanded and supplied equal one another only where the supply and demand curves cross, at point *e*. Alternatively, you can see this in the table that is part of the figure: Quantity demanded and quantity supplied are the same at only one particular point. At \$60 a game, sellers are willing to provide exactly the same quantity as consumers would like to

Equilibrium

Market forces are in balance where the quantities demanded by consumers just equal quantities supplied by producers.

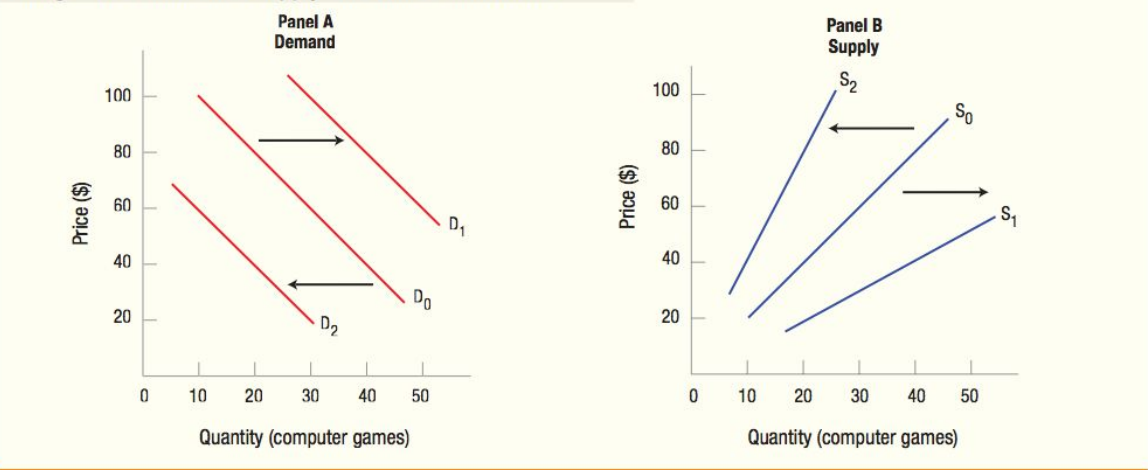
Equilibrium price

Market equilibrium price is the price that results when quantity demanded is just equal to quantity supplied.

Equilibrium quantity

Market equilibrium quantity is the output that results when quantity demanded is just equal to quantity supplied.

FIGURE 6
Changes in Demand and Supply and Their Determinants

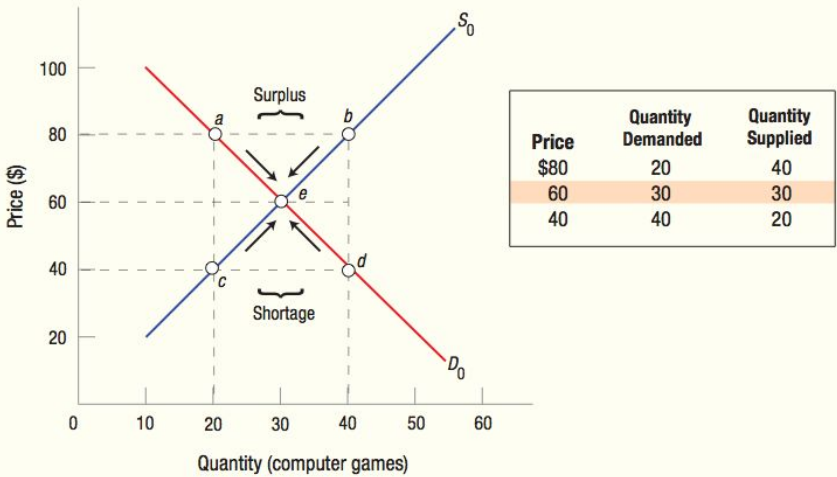


Determinants of Demand		Determinants of Supply	
Decrease in Demand	Increase in Demand	Decrease in Supply	Increase in Supply
Tastes and preferences decline (less advertising, out of fashion).	Tastes and preferences grow (more advertising, fad).	Technology harms productivity (unusual).	Technology improves productivity (production robots in factories increase productivity and supply).
Income falls (economy is in a recession).	Income rises (economy is booming).	Resource costs rise (tough collective bargaining by unions could lead to higher labor costs and reduce supply).	Resource costs fall (large discoveries of natural resources such as oil, natural gas, would reduce world prices, increasing supply of products using these resources).
Price of substitute falls (price of tea falls, coffee demand declines). Price of complement rises (price of gasoline rises, demand for big SUVs drops).	Price of substitute rises (chicken prices rise, demand for beef increases). Price of complement falls (price of DVD players falls, demand for DVD movies increases).	Price of a production substitute rises (cucumber prices rise, reducing the supply of radishes as more cucumbers are planted).	Price of a production substitute falls (price of apples falls, landowners plant grapes instead and eventually the supply of wine rises).
Number of buyers falls.	Number of buyers grows.	Expectation of a rise in future price of product (unsettled world conditions lead to expectations that gold will jump in price, which may lead to a withholding of gold from the market, reducing current supply).	Falling future price expectations for product (if beef prices are expected to fall, producers may sell more cattle now).
Expecting future glut; expected surplus in future leads to lower prices so consumers hold off buying now (some consumers wait for after Christmas sales of unsold—surplus—merchandise).	Expecting future shortages; leads to stocking up now to avoid higher prices in future (predicted gasoline shortages lead to filling of tanks now—an increase in current demand).	Decreasing number of sellers	Rising number of sellers
		Increase in taxes or reduction in subsidies (increasing taxes on cigarettes or reducing subsidies for ethanol will reduce supplies of both products).	Decrease in taxes or an increase in subsidies (reductions in excise taxes on luxury vehicles and increases in subsidies to education will increase the supply of both).

FIGURE 7

Equilibrium Price and Quantity of Computer Games

Market equilibrium is achieved when quantity demanded and quantity supplied are equal. In this graph, that equilibrium occurs at point *e*, at an equilibrium price of \$60 and an equilibrium output of 30. If the market price is above equilibrium (\$80), a surplus of 20 computer games will result ($b - a$), automatically driving the price back down to \$60. When the market price is too low (\$40), a shortage of 20 computer games will result ($d - c$), and businesses will raise their offering prices until equilibrium is again restored.



Surplus

Occurs when the price is above market equilibrium, and quantity supplied exceeds quantity demanded.

Shortage

Occurs when the price is below market equilibrium, and quantity demanded exceeds quantity supplied.

purchase. Hence, at this price, the market clears, since buyers and sellers both want to transact the same number of units.

The beauty of a market is that it automatically works to establish the equilibrium price and quantity, without any guidance from anyone. To see how this happens, let us assume that computer games are initially priced at \$80, a price above their equilibrium price. As we can see by comparing points *a* and *b*, sellers are willing to supply more games at this price than consumers are willing to buy. Economists characterize such a situation as one of excess supply, or **surplus**. In this case, at \$80, sellers supply 40 games to the market (point *b*), yet buyers want to purchase only 20 (point *a*). This leaves an excess of 20 games overhanging the market; these unsold games ultimately become surplus inventories.

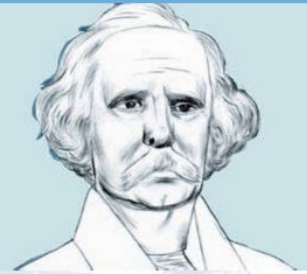
Here is where the market kicks in to restore equilibrium. As inventories rise, most firms will cut production. Some firms, moreover, will start reducing their prices to increase sales. Other firms must then cut their own prices to remain competitive. This process will continue, with firms cutting their prices and production, until most firms have managed to exhaust their surplus inventories. This happens when prices reach \$60 and quantity supplied equals 30, since consumers are once again willing to buy up the entire quantity supplied at this price, and the market is restored to equilibrium.

In general, therefore, when prices are set too high, surpluses result, which drive prices back down to their equilibrium levels. If, conversely, a price is initially set too low, say at \$40, a **shortage** results. In this case, buyers want to purchase 40 games (point *d*), but sellers are only providing 20 (point *c*), creating a shortage of 20 games. Because consumers are willing to pay more than \$40 to get hold of the few games available on the market, they will start bidding up the price of computer games. Sensing an opportunity to make some money, firms will start raising their prices and increasing production, once again until equilibrium is restored. Hence, in general, excess demand causes firms to raise prices and increase production.

When there is a shortage in a market, economists speak of a tight market or a seller's market. Under these conditions, producers have no difficulty selling off all their output. When a surplus of goods floods the market, this gives rise to a buyer's market, since buyers can buy all the goods they want at attractive prices.

We have now seen how changing prices naturally work to clear up shortages and surpluses, thereby returning markets to equilibrium. Some markets, once disturbed, will return to equilibrium quickly. Examples include the stock, bond, and money mar-

Alfred Marshall (1842–1924)



British economist Alfred Marshall is considered the father of the modern theory of supply and demand—price and output are determined by both supply and demand. He noted that the two go together like the blades of a scissors that cross at equilibrium.

He assumed that changes in quantity demanded were only affected by changes in price, and that all other factors remained constant. Marshall also is credited with developing the ideas of the laws of demand and supply, and the concepts of price elasticity of demand, consumer surplus, and producer surplus—concepts we will study in the next two chapters.

In 1890, he published *Principles of Economics* at age 48. In it he introduced many new ideas for the first time, but as Ray Canterbury noted, “without any suggestion that they are novel or remarkable.”³ During his lifetime, the book went through eight editions. In hopes of appealing to the general populace, Marshall buried his diagrams in footnotes. And, although he is credited with many economic theories, he would always clarify them with various exceptions and qualifications. He expected future economists to flesh out his ideas.

John Maynard Keynes, the most influential economist of the last century and Marshall's student, wrote a 70-page, 20,000-word memorial to Marshall published in the *Economic Journal*, 3 months after his death in 1924.⁴

Marshall was an enormous figure in economics, but a disappointment to his father, because he went to study mathematics and physics at St. John's College, Cambridge, instead of joining the clergy, as was expected. But after long walks through the poorest sections of several European cities and seeing their horrible conditions, he decided to focus his attention on political economy. More than anyone else, Marshall is given credit for establishing economics as a discipline of study.

kets, where trading is nearly instantaneous and extensive information abounds. Other markets react very slowly. Consider the labor market, for instance. For various psychological reasons, most people have an inflated idea of their worth to both current and future employers. It is only after an extended bout of unemployment, therefore,

³E. Ray Canterbury, *A Brief History of Economics: Artful Approaches to the Dismal Science* (New Jersey: World Scientific), 2001, p. 139.

⁴Robert Skidelsky, *John Maynard Keynes: Volume Two The Economist as Saviour 1920–1937* (New York: Penguin), 1992, p. 181.

that many people will face reality and accept a position at a salary lower than their previous job. Similarly, real estate markets can be slow to adjust since sellers will often refuse to accept a price below what they are asking for, until the lack of sales over time convinces sellers to adjust the price downward.

These automatic market adjustments can make some buyers and sellers feel uncomfortable: It seems as if prices and quantities are being set by forces beyond anyone's control. In fact, this phenomenon is precisely what makes market economies function so efficiently. Without anyone needing to be in control, prices and quantities will naturally gravitate toward equilibrium levels. Adam Smith was so impressed by the workings of the market that he suggested it is almost as if an "invisible hand" guides the market to equilibrium.

Given the self-correcting nature of the market, long-term shortages or surpluses are almost always the result of government intervention. We will discuss such instances in the next chapter. First, however, we turn to a discussion of how the market responds to changes in supply and demand, or to shifts of the supply and demand curves.

Moving to a New Equilibrium: Changes in Supply and Demand

Once a market is in equilibrium and the forces of supply and demand balance one another out, the market will remain there unless an external factor changes. But when the supply curve or demand curve shifts (some determinant changes), equilibrium also shifts, resulting in a new equilibrium price and/or output. The ability to predict new equilibrium points is one of the most useful aspects of supply and demand analysis.

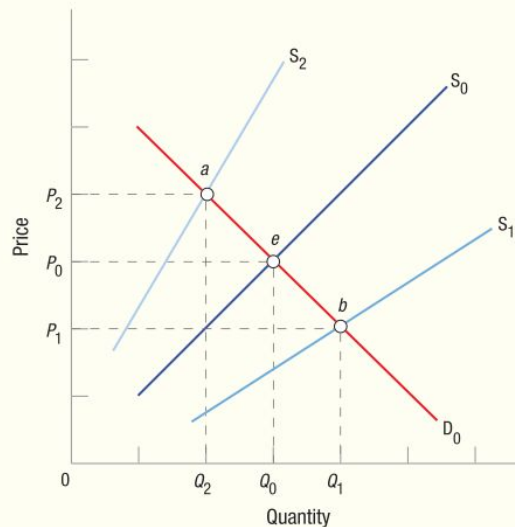
Predicting the New Equilibrium When One Curve Shifts

When only supply or only demand changes, the change in equilibrium price and equilibrium output can be predicted. We begin with changes in supply.

Changes in Supply. Figure 8 shows what happens when supply changes. Equilibrium initially is at point e , with equilibrium price and quantity at P_0 and Q_0 , respectively. But let us assume a rise in wages or the bankruptcy of a key business in the market (the number of sellers declines) causes a decrease in supply. When supply

FIGURE 8
Equilibrium Price, Output, and Shifts in Supply

When supply alone shifts, the effects on both equilibrium price and output can be predicted. When supply grows (S_0 to S_1), equilibrium price will fall and output will rise. When supply declines (S_0 to S_2), the opposite will happen: Equilibrium price will rise and output will fall.



declines (the supply curve shifts from S_0 to S_2), equilibrium price rises to P_2 , while equilibrium output falls to Q_2 (point a).

If, on the other hand, supply increases (the supply curve shifts from S_0 to S_1), equilibrium price falls to P_1 , while equilibrium output rises to Q_1 (point b). This is what has happened in the electronics industry: Declining production costs have resulted in more electronic products being sold at lower prices.

Changes in Demand. The effects of demand changes are shown in Figure 9. Again, equilibrium is initially at point e , with equilibrium price and quantity at P_0 and Q_0 , respectively. But let us assume the economy then enters a recession and incomes sink, or perhaps the price of some complementary good soars; in either case, demand falls. As demand declines (the demand curve shifts from D_0 to D_2), equilibrium price falls to P_2 , while equilibrium output falls to Q_2 (point a).

During the same recession just described, the demand for inferior goods (beans and baloney) will rise, as declining incomes force people to switch to cheaper substitutes. For these products, as demand increases (shifting the demand curve from D_0 to D_1), equilibrium price rises to P_1 , and equilibrium output grows to Q_1 (point b).

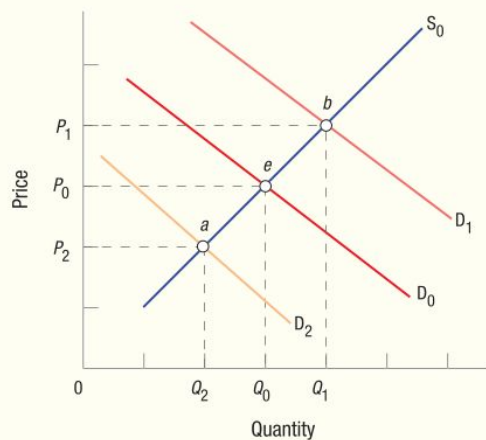


FIGURE 9

Equilibrium Price, Output, and Shifts in Demand

When demand alone changes, the effects on both equilibrium price and output can again be determined. When demand grows (D_0 to D_1), both price and output rise. Conversely, when demand falls (D_0 to D_2), both price and output fall.

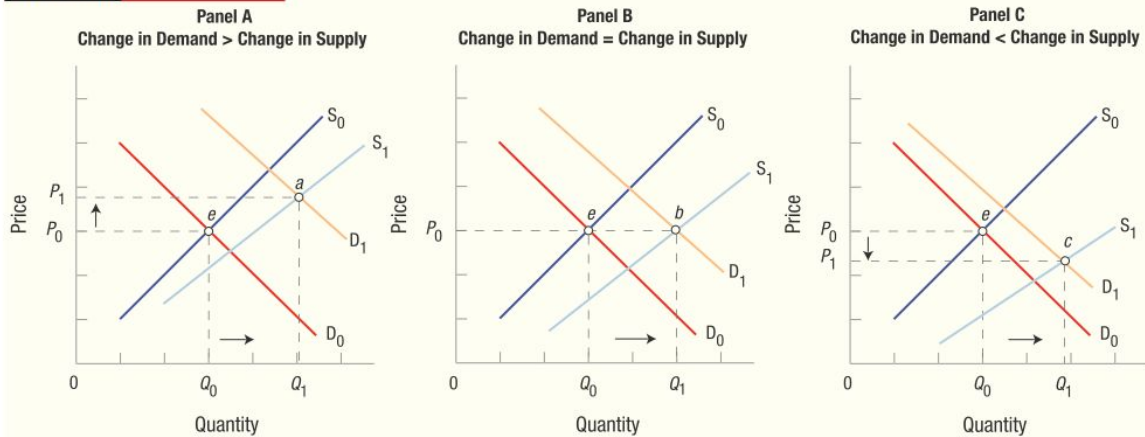
Predicting the New Equilibrium When Both Curves Shift

When both supply and demand change, things get tricky. We can predict what will happen with price, in some cases, and output, in other cases, but not what will happen with both.

When Both Curves Shift in the Same Direction. Figure 10 on the next page portrays an increase in both demand and supply. Consider the market for corn. If government subsidizes the production of ethanol, demand for corn will increase. If bioengineering results in a new corn hybrid that uses less fertilizer and generates 50% higher yields, supply will increase. When demand increases from D_0 to D_1 and supply increases from S_0 to S_1 , output clearly grows to Q_1 . What happens to the price of corn, however, is not so clear. If demand grows relatively more than supply (Panel A), the new equilibrium price will be higher. Conversely, if demand grows relatively less than supply does (Panel C), the new equilibrium price will be lower.

In Figure 11 on the next page, supply and demand have declined to S_2 and D_2 , respectively. If this is the cellular phone market, and cell phone use is shown to have serious detrimental health effects if used more than 10 minutes a day, the demand will decline. And if microchip production confronts the end of Moore's law

FIGURE 10



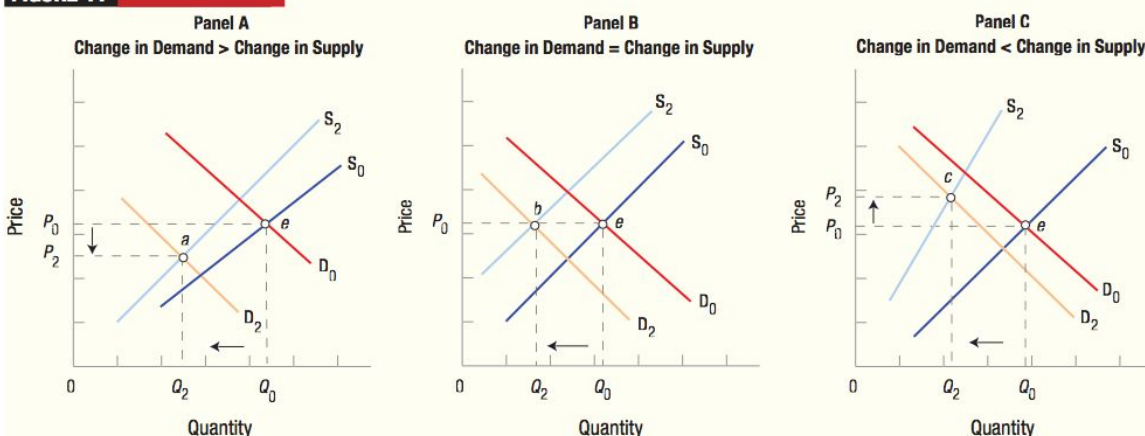
Increase in Supply, Increase in Demand, and Equilibrium

When both demand and supply increase, output will clearly rise. What will happen to the equilibrium price is uncertain, however. If demand grows relatively more than supply (Panel A), price will rise, but if supply grows relatively more than demand (Panel C), price will fall.

(speed of micro chips doubles every 18 months at lower costs) and costs rise substantially, supply will decline. In this case, we can see that output will fall to Q_2 . Again, however, what happens to price is ambiguous. If demand declines more than supply, price will fall. Alternatively, if supply declines more than demand, the new equilibrium price will be higher.

Thus, when supply and demand decline or rise together, we can forecast what will happen to output. In such cases, however, the change in price cannot be pre-

FIGURE 11

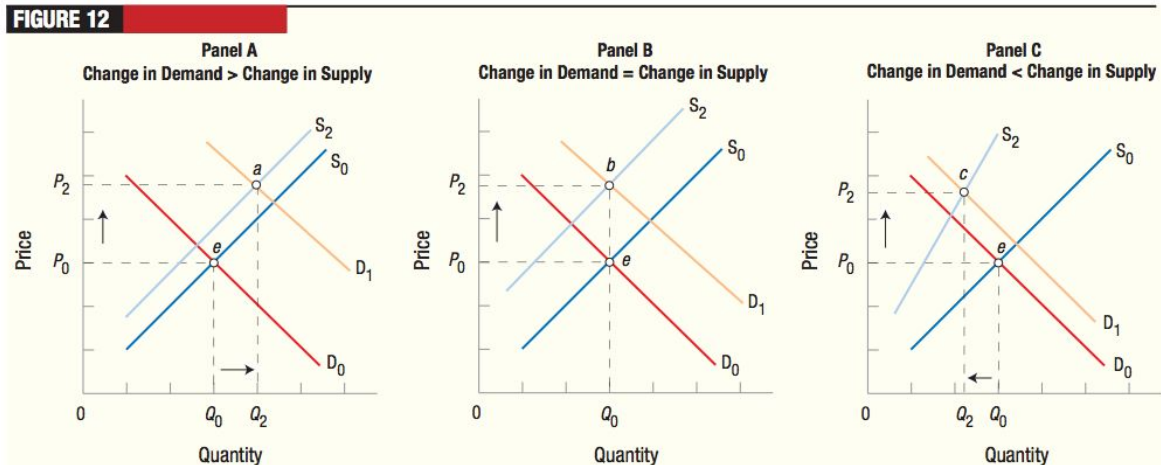


Decrease in Supply, Decrease in Demand, and Equilibrium

When both demand and supply decrease, output will clearly fall, but what happens to the new equilibrium price is again uncertain. If demand falls relatively more than supply, the new equilibrium price will fall, and vice versa.

dicted without further information regarding the relative magnitudes of the changes in supply and demand.

When the Curves Shift in Opposite Directions. Figure 12 illustrates the case of rising demand and decreasing supply. This might represent the market for General Motors' cars if China offers high prices and absorbs most of the world's steel output for its own development efforts, increasing the price of a major input into GM's cars. Not to be deterred, GM develops a plug-in hybrid that averages over 75 miles per gallon and demand rises substantially. Demand increases to D_1 and supply decreases to S_2 , thus clearly raising price to P_2 . Still, what happens to equilibrium sales is ambiguous. If demand grows more than supply declines (Panel A), the new equilibrium output will be higher than before. But if supply declines more than demand grows (Panel C), the new equilibrium output will be lower.



Decrease in Supply, Increase in Demand, and Equilibrium

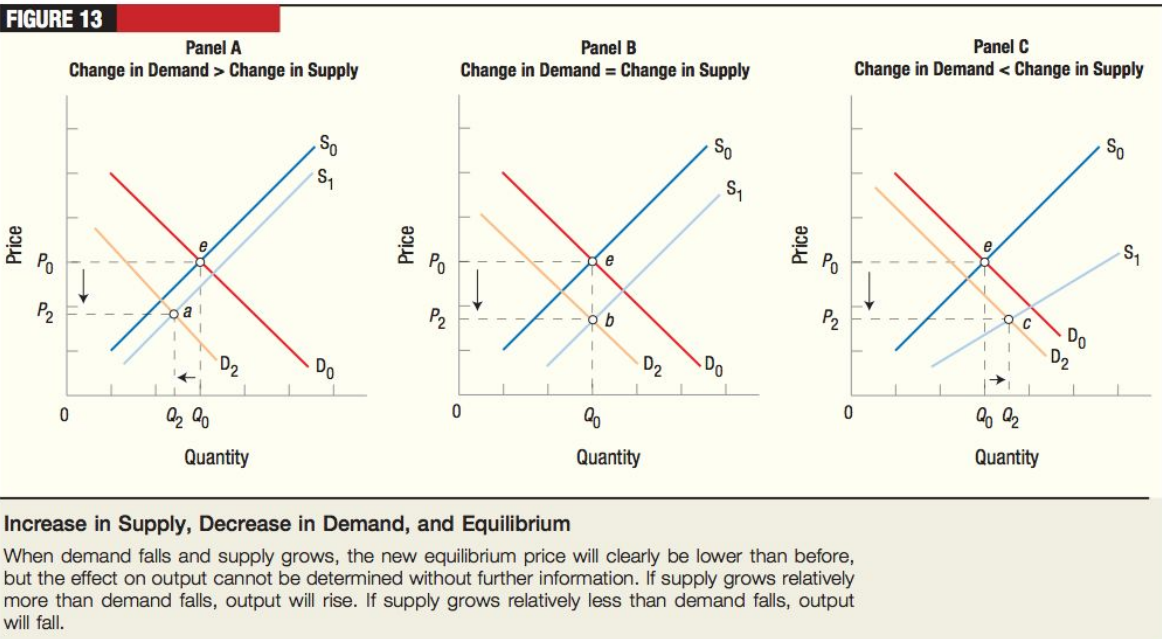
If demand grows and supply falls, equilibrium price will clearly rise, but now what happens to equilibrium output is indeterminate. If supply declines relatively more than demand grows, output will fall. If supply declines less than demand grows, output will rise.

In Figure 13 on the next page, we have the opposite case, where demand declines to D_2 and supply rises to S_1 . This might represent the market for tape players and recorders and their decline in demand in the digital age. However, costs to manufacture these players have fallen given changing production technology. In this case, we can see that price will fall to P_2 , but again, what happens with output is uncertain. If demand declines more than supply grows (Panel A), output will fall. Conversely, if supply grows more than demand falls (Panel C), the new equilibrium output will rise.

Thus, when supply and demand move in opposite directions, the resulting change in price can be predicted. Forecasting the accompanying change in output is impossible, however, without additional information concerning the relative strength of the changes in supply and demand.

Summarizing Shifts and Equilibrium

With these results in hand, a summary of what happens when both curves shift is in order. When demand and supply both increase or both decrease together (whenver they move in the same direction), the change in sales or output can be predicted. Specifically, when both curves rise, sales rise, and when both curves fall,



sales fall. In neither case can we know what happens to price, however, without further information.

When supply and demand move in opposite directions, by contrast, the change in price can be forecasted. Specifically, when demand rises but supply falls—people want more of something that has become dearer—price will rise. Alternately, when demand falls but supply increases—there is more on the market of some good that people are less interested in—price will fall. Still, in both of these cases what happens to sales or output remains ambiguous without further information.

These results are summarized in Table 1. Where the table indicates that equilibrium price or quantity is indeterminate, it means that the change will depend on

Table 1		The Effect of Changes in Demand or Supply on Equilibrium Prices and Quantities		
Change in Demand	Change in Supply	Change in Equilibrium Price	Change in Equilibrium Quantity	Figure Where Result is Shown
No change	Increase	Decrease	Increase	8
No change	Decrease	Increase	Decrease	8
Increase	No change	Increase	Increase	9
Decrease	No change	Decrease	Decrease	9
Increase	Increase	Indeterminate	Increase	10
Decrease	Decrease	Indeterminate	Decrease	11
Increase	Decrease	Increase	Indeterminate	12
Decrease	Increase	Decrease	Indeterminate	13

the relative magnitudes of the shifts in supply or demand, and price or quantity can rise, fall, or remain the same. The last column in the table shows the figure where this result is shown.

Checkpoint

Market Equilibrium

REVIEW

- Together, supply and demand determine market equilibrium.
- Equilibrium occurs when quantity supplied exactly equals quantity demanded.
- The equilibrium price is also called the market-clearing price.
- When supply and demand change, equilibrium price and output change.
- When only one curve shifts, the resulting changes in equilibrium price and quantity can be predicted.
- When both curves shift, we can predict the change in equilibrium price in some cases or the change in equilibrium quantity in others, but never both. We have to determine the relative magnitudes of the shifts before we can predict both equilibrium price and quantity.

QUESTIONS

As China and India (both with huge populations and rapidly growing economies) continue to develop, what do you think will happen to their demand for energy and specifically oil? What will suppliers of oil do in the face of this demand? Will this have an impact on world energy (oil) prices? What sort of policies or events could alter your forecast about the future price of oil?

Answers to the Checkpoint questions can be found at the end of this chapter.

Putting Supply and Demand to Work

Excess Grape Supply and Two-Buck Chuck

Let's apply these concepts to two short examples. The great California wines of the 1990s put California vineyards on the map. Demand, prices, and exports grew rapidly. Overplanting of new grape vines was a result. Driving along Interstate 5 or Highway 101 north of Los Angeles, grape vineyards extend as far as the eye can see, and most were planted in the mid to late 1990s. The 2001 recession reduced the demand for California wine, and a rising dollar made imported wine relatively cheaper. The result was a sharp drop in demand for California wine and a huge surplus of grapes.

Bronco Wine Company President Fred Franzia made an exclusive deal with Trader Joe's (an unusual supermarket that features exotic food and wine products), bought the excess grapes at distressed prices, and with his modern plant produced inexpensive wine under the Charles Shaw label. Selling for \$1.99 a bottle, Two-Buck Chuck, as it is known, is available in chardonnay, merlot, cabernet sauvignon, shiraz, and sauvignon blanc. Consumers have flocked to Trader Joe's and literally haul cases of wine out by the carload. Today, Two-Buck Chuck sells well over a million cases a month. This is not rotgut: the 2002 shiraz beat out 2,300 other wines to win a double gold medal at the 28th Annual International Eastern Wine Competition in 2004.



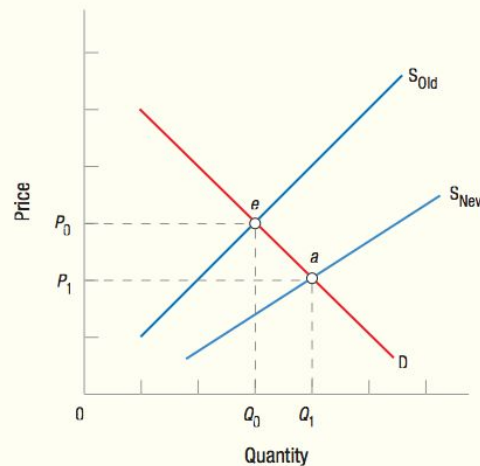
Donald Gruener

Two-Buck Chuck was such a hit that other supermarkets were forced to offer their own discount wines. This good, low-priced wine has had the effect of opening up markets. As Figure 14 illustrates, people who previously avoided wine because of the cost have begun drinking more (demand curves do slope down and to the right). As *The Economist* has noted, the entire industry may benefit because “wine drinkers who start off drinking plonk often graduate to upmarket varieties.”⁵

FIGURE 14

The Market for Wine

The glut of grapes and the subsequent reduction in grape prices caused the supply of wine to increase and the price to fall.



Trek Bicycles and Lance Armstrong

The second example deals with a growing demand but no change in supply. When Lance Armstrong won his seventh Tour de France cycling championship in July 2005, he rode a bicycle made by Trek of the United States.⁶ So, on the demand side, we can expect demand for the victor's brand of bicycles to go up. This in fact happened, in both the United States and Europe. On the supply side, U.S. bicycle manufacturers such as Trek and Cannondale were willing to increase output, as shown in Figure 15 (note that the supply curve didn't change, only quantity supplied). This process worked well in the United States, but proved tougher in Europe, not so much in the actual production of the bicycles but in getting stores to stock them. Up until a few years ago, racing bicycles were almost exclusively made by European companies.

Using our supply and demand analysis, we see that demand increased. Since no determinant of supply changed, we know that output will increase, and prices for Trek bicycles will rise. Our supply and demand analysis gives us a useful framework for predicting how market participants will act, and what the resulting price and output might be.

You now have the fundamental tools of supply and demand analysis. In the next chapter, we will use these tools to analyze markets, policy choices, and government intervention.

⁵“California Drinking,” *The Economist*, June 7, 2003, p. 56.

⁶See Ian Austen, “U.S. Bike Makers Seek Dominance in Europe,” *New York Times*, December 30, 2003, p. W1.

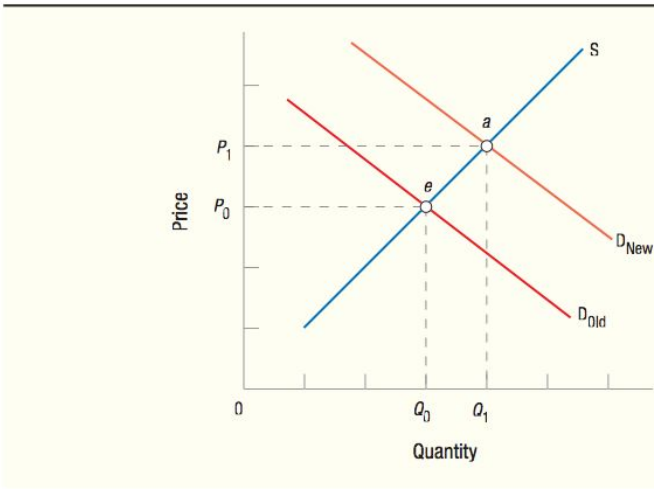


FIGURE 15
The Market for Bicycles
The demand for bicycles rose after Lance Armstrong won his seventh Tour de France, and as expected, prices of Trek bicycles rose.

Key Concepts

- | | |
|-------------------------------|------------------------------------|
| Markets, p. 52 | Change in quantity demanded, p. 59 |
| Price system, p. 53 | Supply, p. 60 |
| Demand, p. 53 | Law of supply, p. 60 |
| Law of demand, p. 54 | Supply curve, p. 61 |
| Demand curve, p. 55 | Determinants of supply, p. 61 |
| Horizontal summation, p. 55 | Change in supply, p. 63 |
| Determinants of demand, p. 56 | Change in quantity supplied, p. 63 |
| Normal goods, p. 57 | Equilibrium, p. 64 |
| Inferior goods, p. 57 | Equilibrium price, p. 64 |
| Substitute goods, p. 57 | Equilibrium quantity, p. 64 |
| Complementary goods, p. 57 | Surplus, p. 66 |
| Change in demand, p. 58 | Shortage, p. 66 |

Chapter Summary

Markets

Markets are institutions that enable buyers and sellers to interact and transact business with one another. Markets differ in geographical location, products offered, and size. Prices contain an incredible amount of information for both buyers and sellers. Through their purchases, consumers signal their willingness to exchange money or other valuables for particular products at particular prices. These signals help businesses to decide what to produce and how much of it to produce. Consequently, the market economy is often called the price system.

Demand

Demand refers to the quantity of products people are willing and able to purchase during some specific time period, all other relevant factors being held constant. Price and quantity demanded stand in a negative (inverse) relationship: as price rises, consumers buy fewer units; and as price falls, consumers buy more units. This inverse relation is known as the law of demand. It is depicted in a downward-sloping demand curve.

Market demand curves are found by horizontally summing individual demand curves. We simply add the total quantities demanded by all consumers for each possible price.

The determinants of demand include (1) consumer tastes and preferences, (2) income, (3) prices of substitutes and complements, (4) the number of buyers in the market, and (5) expectations regarding future prices, incomes, and product availability. Demand changes (the demand curve shifts) when one or more of these determinants change.

A shift of the demand curve implies a change in demand. A shift to the right reflects an increase in demand, whereas a shift to the left represents a decline in demand. These shifts in demand are caused by changes in one or more of the determinants of demand. A change in quantity demanded occurs only when the price of a product changes, leading consumers to adjust their purchases along the existing demand curve.

Supply

Supply is the quantity of a product producers are willing and able to put on the market at various prices, all other relevant factors being held constant. The law of supply reflects the positive relationship between price and quantity supplied: The higher the market price, the more goods supplied; and the lower the market price, the fewer goods supplied. It is depicted in an upward-sloping supply curve. Market supply, as with market demand, is arrived at by horizontally summing the individual supplies of all of the firms in the market.

The six determinants of supply are (1) production technology, (2) the cost of resources, (3) prices of other commodities, (4) expectations, (5) the number of sellers or producers in the market, and (6) taxes and subsidies.

When one or more of the determinants of supply change, a change in supply results, causing a shift in the supply curve. A shift to the right reflects an increase in supply, whereas a shift to the left represents a decline in supply. A change in quantity supplied is only caused by a change in the price of the product; it results in a movement along the existing supply curve. A reduction in price results in a reduction of quantity supplied, whereas a price increase leads to an increase in quantity supplied.

Market Equilibrium

Supply and demand together determine market equilibrium. Equilibrium occurs when quantity demanded and quantity supplied are precisely equal. This means that producers are bringing precisely the quantity of some good to market that consumers wish to purchase, such that the market clears. The price at which equilibrium is reached is called the equilibrium price, or the market-clearing price.

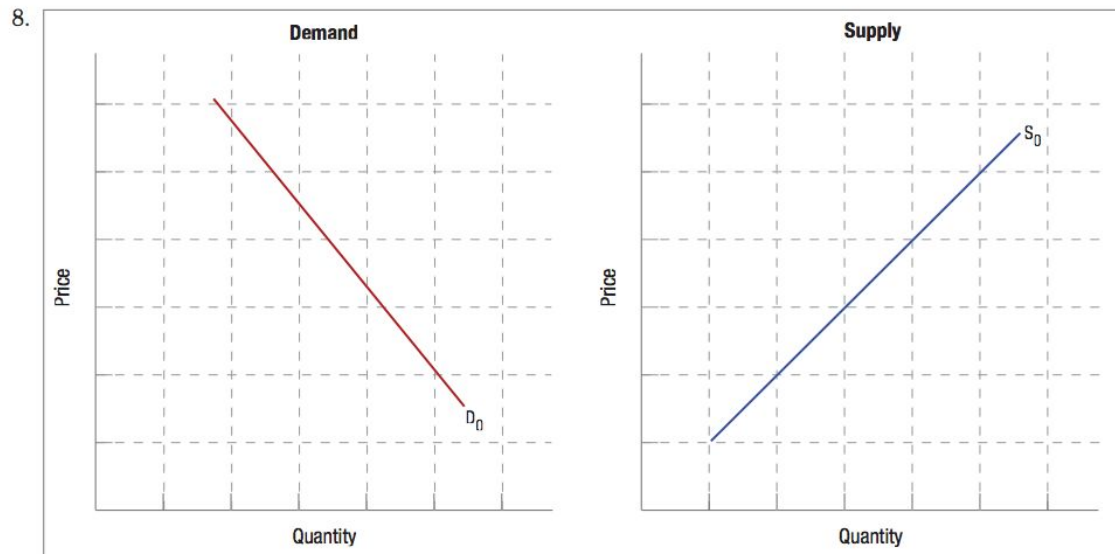
If prices are set too high, surpluses result, which drive prices back down to equilibrium levels. If prices are set too low, a shortage results, which drives prices up until equilibrium is reached.

When supply and demand change (a shift in the curves), equilibrium price and output change. When only one curve shifts, then both resulting changes in equilibrium price and quantity can be predicted. For example, if demand increases, both equilibrium output and price will increase.

When the two curves both shift, the change in equilibrium price can be forecasted in some instances, and the change in equilibrium output in others, but never both. When both curves shift in the same direction, we can predict what will happen to output but not to price. When both curves shift in opposite directions, we can predict what will happen to price but not to output. We need more information on the relative magnitudes of the shifts in both curves before we can predict both equilibrium price and quantity.

Questions and Problems

1. Product prices give consumers and businesses a lot of information besides just the price. What are they?
2. Demand for tickets to sports events such as the Super Bowl has increased. Has supply increased? What does the answer to this tell you about the price of these tickets compared to a few years ago?
3. As the world population ages, the demand for cholesterol drugs will [increase/decrease/remain the same]? Assume there is a positive relationship between aging and cholesterol levels. Is this change a change in demand or a change in quantity demanded?
4. Describe some of the reasons why supply will change. Improved technology typically results in lower prices for most products. Why do you think this is true? Describe the difference between a change in supply and a change in quantity supplied.
5. In 2006 rental car companies often charged more to rent a compact car than an SUV or a luxury vehicle. Why do you think rental companies turned their normal pricing structure on its head?
6. Both individual and market demand curves have negative slopes and reflect the law of demand. What is the difference between the two curves?
7. Describe the determinants of demand. Why are they important?



Using the figures above, answer the following questions:

- a. On the Demand panel:
 - Show an increase in demand and label it D_1 .
 - Show a decrease in demand and label it D_2 .
 - Show an increase in quantity demanded.
 - Show a decrease in quantity demanded.
 - What causes demand to change?
 - What causes quantity demanded to change?

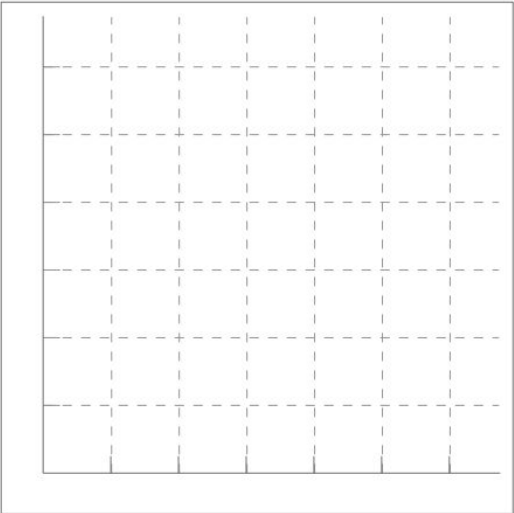
- b. On the Supply panel:
- Show an increase in supply and label it S_1 .
 - Show a decrease in supply and label it S_2 .
 - Show an increase in quantity supplied.
 - Show a decrease in quantity supplied.
 - What causes supply to change?
 - What causes quantity supplied to change?
9. Several medical studies have shown that red wine in moderation is good for the heart. How would such a study affect the public's demand for wine? Would it have an impact on the type of grapes planted in new vineyards?
10. Norrath is a place in the online game EverQuest II. It is a virtual world with roughly 350,000 players "arrayed over worlds that are tethered to dozens of servers." As Rob Walker noted, "EverQuest is filled with half-elves, castles, sword fights and such, and involves a fairly complex internal economy, whose currency is platinum pieces used to buy weapons, food and other goods." This virtual market, however, has led to a real-world market, with real dollars for virtual goods. Players sell weapons, complete characters, and other virtual items on EverQuest's internal market called Station Exchange and on eBay. Common items sell for \$10 to \$25, while extensive characters or weapons can fetch a thousand dollars or more. (Based on Rob Walker, "The Buying Game: A real market, overseen by a real corporation, selling things that don't really exist," *New York Times Magazine*, October 16, 2005, p. 28.)
- Why would someone buy virtual goods? Does supply and demand play any role in this real market for virtual goods? If there were virtual games similar to EverQuest II where everything is free, would any real markets exist for their virtual goods? How does paying for a virtual product differ from the situation where a buyer could purchase a nice watch for a reasonable price, but decides to buy a luxury brand for 10 to 20 times as much?
11. In December of 2005, the *Wall Street Journal* reported that Clark Foam, a major supplier of polyurethane cores (blanks) for hand-shaped surfboards, closed its plant and went out of business (Peter Sanders and Stephanie Kang, "Wipeout for Key Player in Surfboard Industry," *The Wall Street Journal*, December 8, 2005, p. B1). Clark Foam was the Microsoft of surfboard blank makers, and had been supplying foam blanks to surf shops for over 50 years. Polyurethane blanks, while light and sturdy, contain a toxic chemical, toluene diisocyanate (TDI). Over the last two decades the Environmental Protection Agency has increasingly been restricting the use of TDI. Clark Foam's owner Gordon "Grubby" Clark indicated in a letter to customers that he was tired of fighting environmental regulators, lawsuits over injury to employees, and fire regulations. Surf historian and author of *The Encyclopedia of Surfing*, Matt Warshaw said, "It's the equivalent of removing lumber for the housing industry."
- a. If you owned a retail surfboard shop and read this article in the *Wall Street Journal*, would you change the prices on the existing surfboards you have in the shop? Why or why not?
- b. If the demand for surfboards remains constant over the next few years, what would you expect to see happen on the supply side in this industry?
12. Polysilicon is used to produce computer chips and solar photovoltaics. Currently more polysilicon is used to produce computer chips, but the demand for ultra-pure polysilicon for solar panels is rising. According to a 2006 *Business Week* article (John Carey, "What's Raining on Solar's Parade," *Business Week*, February 6, 2006, p. 78), this has created a shortage, and prices have more than doubled between 2004 and 2006.

- a. High oil and energy prices, along with subsidies from U.S. and European governments for solar power, has increased demand, but suppliers are reluctant to build new factories or expand existing facilities, because they fear governments can easily eliminate incentives and at this point they do not know if solar energy is just a fad as one executive suggested, “governments can take away incentives as easily as they put them in place,” and asked “is the solar industry real or just a flash in the pan?” Are these legitimate concerns for business?

b. Given the uncertainty associated with building additional production capacity in the polysilicon industry, what might these manufacturers do to reduce the risk?
13. The table below represents the world supply and demand for natural vanilla in thousands of pounds. A large portion of natural vanilla is grown in Madagascar and comes from orchids that require a lot of time to cultivate. The sequence of events described below actually happened, but the numbers have been altered to make the calculations easier (See James Altucher, “Supply, Demand, and Edible Orchids,” *Financial Times*, September 20, 2005, p.12). Assume the original supply and demand curves are represented in the table below.

Price (\$/pound)	Quantity Demanded (thousands)	Quantity Supplied (thousands)
0	20	0
10	16	6
20	12	12
30	8	18
40	4	24
50	0	30

- a. Graph both the supply (S_0) and demand (D_0) curves. What is the current equilibrium price? Label that point a .



- b. Assume that Madagascar is hit by a hurricane (actually occurred in 2000), and the world's supply of vanilla is reduced by 5/6, or 83%. Label the new supply curve (S_1). What will be the new equilibrium price in the market? Label that point b .

- c. Now assume that Coca-Cola announces plans to introduce a new “Vanilla Coke,” and this increases the demand for natural vanilla by 25%. Label the new demand curve (D_1). What will be the new equilibrium price? Label this new equilibrium point c . Remember that supply of natural vanilla was reduced by the hurricane earlier.
 - d. Growing the orchids that produce natural vanilla requires a climate with roughly 80% humidity, and the possible grower countries generally fall within 20° north or south of the equator. A doubling of prices encouraged several other countries (e.g., Uganda and Indonesia) to begin growing orchids or up their current production. Within several years, supply was back to normal (S_0), but by then, synthetic vanilla had replaced 80% of the original demand (D_0). Label this new demand curve (D_2). What is the new equilibrium price and output?
14. Assume initially that the demand and supply for premium coffees (one-pound bags) are in equilibrium. Now assume Starbucks introduces the world to premium blends, and so demand rises substantially. Describe what will happen in this market as it moves to a new equilibrium. If a hard freeze eliminates Brazil's premium coffee crop, what will happen to the price of premium coffee?
15. In late 2006 and early 2007, orange crops in Florida were smaller than expected, and the crop in California was put in a deep freeze by an Arctic cold front. As a result, the production of oranges was severely reduced. In addition, in early 2007, President George W. Bush called for the United States to reduce its gasoline consumption by 20% in the next decade. He proposed an increase in ethanol produced from corn and the stalks and leaves from corn and other grasses. What is the likely impact of these two events on food prices in the United States?

Answers to Checkpoint Questions

CHECKPOINT: MARKETS

The market for financial securities is a huge, well-organized, and regulated market compared to local flea markets. Trillions of dollars change hands each week in the financial markets, and products are standardized.

CHECKPOINT: DEMAND

Rising gasoline prices have caused the demand for hybrids to swell. This is a change in demand.

CHECKPOINT: SUPPLY

Since iPods and other MP3 players are substitutes for high-end stereo equipment, production and sales of high-end stereo equipment have declined.

CHECKPOINT: MARKET EQUILIBRIUM

Demand for both energy and oil will increase. Suppliers of oil will attempt to move up their supply curve and provide more to the market. Since all of the easy (cheap) oil has been found, costs to add to supplies will rise, and oil prices will gradually rise; in the longer term, alternatives will become more attractive, keeping oil prices from rising too rapidly.



Market Efficiency, Market Failure, and Government Intervention

4

Everywhere we look in the world there are markets, from the Tokyo fish markets, where every morning 20,000 flash-frozen tuna weighing 400–500 pounds each are auctioned off in a few hours; to Aalsmeer, Holland, where millions of fresh flowers are flown in from all over the world every day, auctioned off, then shipped to firms in other parts of the world; to Chicago, where billions of dollars of derivative securities and commodities are bought and sold on the futures market daily. Beyond these big markets, moreover, countless smaller markets dot our local landscapes, and many new virtual markets are springing up on the Internet.

Since the Soviet Union collapsed in 1989, markets and the market system have gained an even greater momentum as many countries have begun leaning more heavily on markets to allocate resources, products, and services. In earlier chapters, we saw that every economy faces tradeoffs in the use of its resources to produce various goods and services, as represented graphically by the production possibilities frontier (PPF). The last chapter considered how supply and demand work together to determine the quantities of various products sold and the equilibrium prices consumers must pay for them in a market economy. As we saw, Adam Smith's invisible hand works to ensure that, in a market society, consumers get what they want.

Thus far, the markets we have studied have been stylized versions of competitive markets: They have featured many buyers and sellers, a uniform product, consumers and sellers who have complete information about the market, and few barriers to market entry or exit.

In this chapter, we will consider some of the complexities inherent to most markets. The typical market does not meet all the criteria of a truly competitive market. That does not mean the supply and demand analysis you just learned will not be useful in analyzing economic events. Often, however, you will need to temper your analysis to fit the specific conditions of the markets you study. As we will find, some markets need constraints or rules to ensure that society gets the best results.

This chapter begins by considering the efficiency of the market system. We look at the conditions needed for a market to exist and be efficient. We also present a tool for determining economic efficiency. Efficient markets are rationing devices, ensuring that those who value a product the most are the ones who get it. Prices and profits help to carry out this rationing by serving as important market signals.

Markets rarely live up to our definition of the competitive market ideal. The second section of this chapter discusses markets in light of real-world experience, specifically focusing on market failures, or deviations from conditions of perfect competition. If a market is not competitive, this does not mean it collapses or is no longer a market. It just means that the market fails to contain the mechanisms for allocating resources in the best possible way, from the perspective of the larger society. In this section, we will also consider several of the common solutions to market failures. Some failures require just a minor fix, such as a new regulation or law, but others may require that the government take over and provide products.

In the final section of this chapter, we will consider what happens when markets work efficiently, but government intervenes by using price controls. The two most common examples of government price setting are rent controls (price ceilings) and minimum wage laws (price floors). You will see the price paid by society when government tampers with efficiently working markets.



After studying this chapter you should be able to

- Understand how markets allocate resources.
- Define the conditions needed for markets to be efficient.
- Understand how markets impose discipline on producers and consumers.
- Understand and be able to use the concepts of consumer and producer surplus.
- Understand what market failure is, and when it occurs.
- Describe the different types of market failure.
- Recognize why government may control prices.
- Understand the effects of price ceilings and price floors.
- Recognize that taxes lead to deadweight losses.

Markets and Efficiency

Markets are efficient mechanisms for allocating resources. Just think how much information a government bureaucrat would need to decide how many flat panel HDTVs should be produced, what companies should produce them, and who should get them. When you consider that our country has many millions of people who might want such televisions and several thousand possible suppliers, it becomes clear the likelihood of a lone bureaucrat or agency developing an efficient plan for HDTV production and distribution is extremely small. This was the problem the Soviet Union faced with virtually every good it produced, and it goes a long way toward explaining that nation's economic and political collapse.

The prices and profits characteristic of the market system provide incentives and signals that are nonexistent or seriously flawed in other systems of resource allocation. The old Soviet joke that “They pretend to pay us and we pretend to work” illustrates this problem. But efficient markets do not just spontaneously develop. They need reasonable laws and institutions to ensure their proper functioning.

Efficient Market Requirements

For markets to be efficient, they must have well-structured institutions. John McMillan¹ suggests five institutional requirements for workable markets: (1) Information is widely available, or in McMillan’s words, “information flows smoothly”; (2) property rights are protected; (3) private contracts are enforced such that “people can be trusted to live up to their promises”; (4) spillovers from other actors are limited, or “side effects of third parties are curtailed”; and (5) competition prevails. Let’s discuss each of these requirements in greater detail.

Accurate Information Is Widely Available

For markets to work efficiently, transactions costs must be kept low. One factor that reduces transactions costs is accurate and readily available information. Negotiations between the parties will be smoother if each party has adequate information about the product. Without good information, one party will not have the confidence needed to value the product so that party will be reluctant to enter into a transaction. Many products today are highly sophisticated, and consumers need high-quality information for good choices. As we will see, this is important for buyers and sellers.

When products are similar, such as oranges, coal, or blank CDs, informational requirements are easily satisfied. In other cases, where a product is extremely complex or conducive to fraud, governments often require that information be public. Securities markets, for instance, have statutory reporting requirements that help to ensure that investors have adequate and comparable information on which to base their investment decisions. This regulation creates the presumption of a fair market.

Property Rights Are Protected

“Imagine a country where nobody can identify who owns what, addresses cannot be easily verified, people cannot be made to pay their debts, resources cannot be conveniently turned into money, ownership cannot be divided into shares, descriptions of assets are not standardized and cannot be easily compared, and the rules that govern property vary from neighborhood to neighborhood or even from street to street.”² These are the conditions Hernando de Soto found throughout most of the developing world.

Most of us are accustomed to elaborate title and insurance provisions that govern the transfer of automobiles, real estate, and corporate shares in this country. In many developing nations, however, no such provisions exist. When a government fails to establish and protect **property rights**, more informal economic mechanisms will evolve. But, as de Soto writes, these informal mechanisms often vary “from neighborhood to neighborhood or even from street to street.” Thus, even though the poor in many developing countries often hold considerable assets, these assets are usually untitled, and this prevents them from being used as capital. You cannot borrow against your home, for instance, to purchase the sewing machine needed to

Property rights

The clear delineation of ownership of property backed by government enforcement.

¹John McMillan, *Reinventing the Bazaar: A Natural History of Markets* (New York: WW Norton), 2002.

²Hernando de Soto, *The Mystery of Capital: Why Capitalism Triumphs in the West and Fails Everywhere Else* (New York: Basic Books), 2000, p. 15.

start a small tailoring business if your family's long-standing ownership of this home has never been legally documented. And this problem, according to de Soto, goes a long way toward explaining why much of the world is mired in poverty.

To see the importance of well-defined property rights, consider the following. Since the discovery of petroleum, whale oil has lost its economic importance, yet some countries and cultures still use whale products. But what if you were to gain ownership of all the whales in the world? How would you use your newly acquired resource? Would your ownership interest affect how whales are harvested? Of course it would. You would hire a marine biologist, for instance, to tell you the best harvest rate. You would not allow your valuable asset to be overharvested into extinction.

Property rights provide a powerful incentive for the optimal use of resources: With ownership comes the incentive not to waste. When property ownership is fuzzy or resources are owned in common by the whole society, the incentives to waste are much stronger. There will be more about this issue later in this chapter.

Contract Obligations Are Enforced

A well-functioning legal system makes doing business easier, and it is absolutely essential for large-scale business activity. Without the safeguards of a legal system, firms must rely on discussions with one another to determine whether customers are credit-worthy, or whether a customer's production order is trustworthy. The risk a seller can reasonably take on a given buyer depends on such information, yet getting information in this fashion is a costly process; it can prevent businesses from growing much larger.

Still, even when a legal system is operating well, markets require some informal rules to create the general presumption that bargains will be kept. Most civil court systems in developed nations take several years to hear and decide disputes. Lawsuits, moreover, are never cheap. You can only imagine the delays in some developing nations. For example, the average case in India may take a decade to litigate because too few resources are devoted to the courts. These problems mean informal arrangements develop, and this can mean that commercial development is severely restricted.

The more valuable the contract, the more a legal instrument is needed to ensure that it is honored. Business relationships involving small amounts can usually rely on simple honesty. But cheating on a large loan, contract, or shipment might be worth the sacrifice of one's reputation, so something more than a handshake is needed to ensure compliance. Large and complex markets need a well running legal system that enforces contracts and agreements.

There Are No External Costs or Benefits

When you drive your car on a crowded highway, you are inflicting *external costs* on other drivers and the larger society by adding to congestion and pollution. By attending a private college, conversely, you are conferring *external benefits* on the rest of us. You are more likely to become a better citizen, be less likely to commit a crime, and will probably pay a greater share of the tax bill. Thus, we all benefit from your education. These external costs and benefits are called *externalities*.

Markets operate most efficiently when externalities are minimized. As we will see later, markets tend to overproduce those commodities with external costs and underproduce those with external benefits. A product's market price reflects its value to consumers and its cost to producers most accurately when the product does not involve third-party costs or benefits.

Competitive Markets Prevail

When a market has many buyers and sellers, no one seller has the ability to raise its price above that of its competitors. To do so would mean losing most of its busi-

ness. In competitive markets, products are close substitutes, so an increase in price by one firm would simply lead consumers to shift their purchases to other firms.

Competitive markets, moreover, tend to aggregate individual appraisals of value into market information. Without a market, values are determined in one-on-one encounters between buyer and seller. Competitive bargaining between many buyers and sellers gives rise to aggregate market prices and values much as prices are set in an auction.

To illustrate, the price for airing sports programming has skyrocketed in recent years, reflecting aggregate values and the power of competitive bidding. Early on, sports insiders knew that sports programming was valuable, but it took years before all the networks saw its real potential. When they finally did, market prices skyrocketed. Today, the National Football League's annual revenue from the sale of broadcast rights totals several billion dollars. In the beginning, only ABC, CBS, and NBC vied for the rights to broadcast games; today the three networks must compete with Fox, ESPN, pay-per-view, and several other cable channels. Competitive bidding has driven the price of carrying games through the roof.

Competitive markets must be open to entry and exit. If government regulations or private barriers restrict entry, higher prices will prevail. Restricted entry creates monopoly power in markets and leads to higher prices for consumers. If easy exit from a business is important for an efficient allocation of resources, the possibility of entry ensures that monopoly power cannot last for long. Restricted entry into the New York cab business, licenses for cornrow wrapping, and street vending permits do little but to protect existing firms, who lobby hard for such restrictions on the grounds of protecting consumers. The real reason for most regulations of this type is to protect incumbent firms.

Good information, protection of property rights, an efficient and fair legal system, the absence of externalities, and competition are all required if society is to get the best from its markets. These elements all work together to make markets efficient, as we will now see.

The Discipline of Markets

Markets impose discipline on consumers and producers. Sellers would like to get away with charging higher prices while producing shoddier goods, thereby earning greater profits. Few manufacturers or service providers turn out terrific goods and services simply to feel good. Rather, their economic survival depends on it. Markets can be brutal; just ask the former executives of Montgomery Ward and a whole host of dot-com firms.

As for us consumers, we all would like to drive better cars, wear nothing but designer clothes, drink the finest wines, and smoke Cuban cigars. (Well, some of us would like the cigars.) For the superrich, such consumption is not only possible but also commonplace. For the rest of us, however, the market rations us out of such goods, except on very special occasions. This is another function of the market: rationing. Given our limited resources, each of us must decide which products are most important to us, since we cannot have unlimited quantities. Everyone chooses based on their tastes, preferences, and limited incomes.

High prices in a market indicate that consumers value a product highly. Higher prices are usually accompanied by higher profits, and these higher profits will attract new firms into the market. These new firms will increase supply, and this reduces prices. The solution for high prices is high prices. As we will see later, however, if something keeps above-market prices from falling, surpluses will accrue. Conversely, if something keeps low prices from rising to their equilibrium level, shortages will result.

Markets can also be useful tools for the government, since markets allocate resources to those individuals or firms that are most efficient. For example, the government uses markets to allocate the radio and cellular spectrum, to supply the

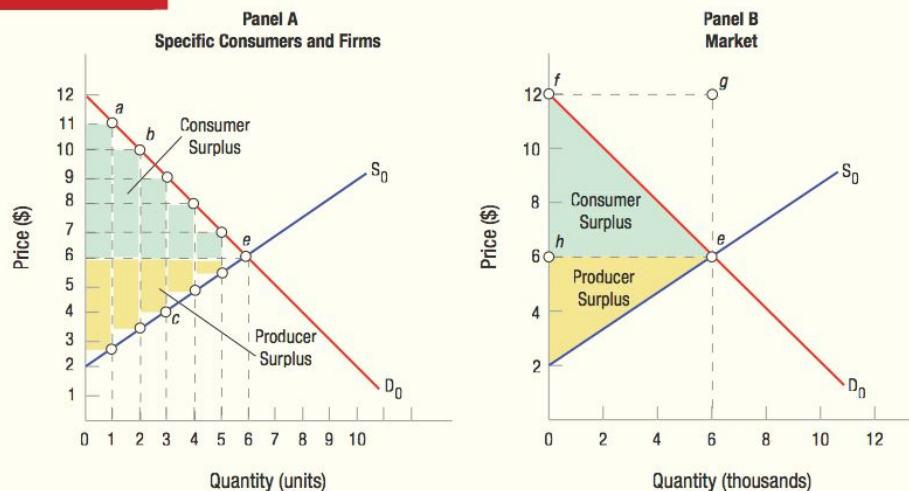
nation's electricity, and to reduce pollution. Central planning is difficult for governments, but private firms can use planning effectively, since a firm's management and stockholders have a vested interest in the firm's success. Product and financial markets, moreover, force a discipline on private firms that is absent when governments centrally plan. If a firm fails to innovate, or if it cooks its books as Enron, the British bank Barings, or the Italian firm Parmalat did, consumers will quit buying its products, financial markets will reduce or call in its loans, and stock markets will decimate its shares.

Consumer and Producer Surplus: A Tool for Measuring Economic Efficiency

Markets determine equilibrium prices and outputs. But both consumers and businesses get extra benefits economists call consumer and producer surplus.

Figure 1 illustrates both through a simple diagram. In both panels, the market determines equilibrium price to be \$6 (point *e*), at which 6 units of output are sold when S_0 and D_0 are the original curves. Assume that each point on the demand curve represents an individual consumer. Some people value the product highly. For instance, the consumer at point *a* in Panel A thinks the product is worth \$11. This consumer clearly gets a bargain, for although she would be willing to pay \$11 for the product, the market determines that \$6 will be the price everyone pays. Economists refer to this excess benefit that these consumers get (\$11 - \$6) as

FIGURE 1



Consumer and Producer Surplus

Panel A shows a market with specific consumers and firms. This small market determines equilibrium price to be \$6 (point *e*), at which 6 units of output are sold. Each point on the demand curve represents a specific consumer, and some people value the product highly. In Panel A, for instance, the consumer at point *a* thinks the product is worth \$11. This consumer clearly gets a bargain, for although she would be willing to pay \$11 for the product, she must pay only \$6. This difference of \$5 is *consumer surplus*. In Panel A, consumer surplus for this market is equal to the sum of individual surpluses. If each point on the supply curve represents a specific supplier, then for similar reasons, producer surplus is the sum of individual firms' producer surplus. Panel B shows how consumer surplus is computed when the market is huge. Consumer surplus is equal to the area under the demand curve but above the equilibrium price of \$6. Thus, total market consumer surplus is equal to half of the rectangle *fgeh*, or $[(\$12 - \$6) \times 6,000] \div 2 = (\$6 \times 6,000) \div 2 = \$18,000$. Producer surplus is the area under equilibrium price but above the supply curve and is computed in a similar fashion, and is equal to $[(\$6 - \$2) \times 6,000] \div 2 = (\$4 \times 6,000) \div 2 = \$12,000$.

consumer surplus. So, for the consumer who purchases the first unit of output, consumer surplus is equal to \$5 ($\$11 - \6). For the consumer purchasing the second unit (point *b*), consumer surplus is a little less, \$4 ($\$10 - \6). And so on for buyers of the third through fifth units of output. Total consumer surplus for the consumers in Panel A is found by adding all of the individual consumer surpluses for each unit purchased. Total consumer surplus in Panel A is equal to $\$5 + \$4 + \$3 + \$2 + \$1 = \15 .

In a similar way, assume that each point on the supply curve represents a specific firm. Notice at point *c* that this supplier is willing to provide the third unit to the market at a price of \$4. Fortunately for them, equilibrium price is \$6, so they receive a **producer surplus** equal to $\$6 - \4 or \$2. Total producer surplus in Panel A is equal to the sum of each firm's producer surplus.

Panel B illustrates consumer and producer surplus for an entire market. For convenience we have simply assumed that the market is 1,000 times larger than that shown in Panel A so the *x* axis is output in thousands. Whereas in Panel A we had discrete individuals and firms, we now have a big market, so consumer surplus is equal to the area under the demand curve above equilibrium price or the area of the shaded triangle labeled "Consumer Surplus."

To put a number to the consumer surplus triangle in Panel B, we can compute the value of the rectangle *fgeh* and divide it in half. Thus total market consumer surplus in Panel B is $[(\$12 - \$6) \times 6,000] \div 2 = (\$6 \times 6,000) \div 2 = \$18,000$. The shaded area labeled "Producer Surplus" is found in the same way and is equal to $[(\$6 - \$2) \times 6,000] \div 2 = (\$4 \times 6,000) \div 2 = \$12,000$.

Markets are efficient from the standpoint that all consumers willing to pay \$6 or more got the product from those firms willing to supply it for \$6 or less. For demand and supply curves D_0 and S_0 , total consumer and producer surplus is maximized. To see why, pick any price other than \$6, and you will see that total consumers' and producers' surplus is less.

These two concepts are important to help us understand the impacts of market shocks and policy changes on consumer and producer well-being. We will use consumer and producer surplus as a way to evaluate the efficiency of policies throughout the remainder of the book.

The vast bulk of economic analysis focuses on questions of efficiency. Economic analysis is good at telling us the costs and benefits associated with various possible courses of action. And this analysis can help us resolve policy disputes that hinge on considerations of equity (or fairness) versus efficiency. If a policy creates considerable unfairness, for instance, while spurring only a small gain in efficiency, some other policy might be better. Still, economists have no more to say about fairness than other people. One person's view of what is fair is just as good as anyone else's. In the end, fairness always comes down to a value judgment.

Consumer surplus

The difference between market price and what consumers (as individuals or the market) would be willing to pay. It is equal to the area above market price and below the demand curve.

Producer surplus

The difference between market price and the price that firms would be willing to supply the product. It is equal to the area below market price and above the supply curve.

Checkpoint

Markets and Efficiency

- Markets are efficient mechanisms for allocating resources. Prices are signals of potential profit.
- For markets to be efficient, information must be widely available, property rights must be protected, private contracts must be enforced, spillovers should be minimal, and competition should prevail.
- Markets impose discipline on producers and consumers.
- Consumer surplus occurs when consumers would have been willing to pay more for a good or service than the going price. Producer surplus occurs when businesses would have been willing to provide products at prices lower than the going

price. Together, consumer and producer surplus can be used to understand the effects of public policies.

QUESTIONS

Business corporations are a basic form of entrepreneurship. When you think of a corporation, do you think of a big bureaucratic organization or a nimble company? Think of new and revolutionary products. For example, consider the Windows operating system produced by Microsoft: Was Microsoft a small or large company when this product was introduced? Do you consider Microsoft to be an entrepreneurial company now?

Answers to the Checkpoint questions can be found at the end of this chapter.

Market Failures

We have seen that for markets to be efficient, they must operate within robust institutional structures. These institutional requirements include accurate information for buyers and sellers, protection of property rights, a legal system that enforces private contracts, an absence of externalities or spillovers, and a fostering of competition. This is a tall order, and many markets do not meet these requirements. When one or more of these conditions are not met, the market is said to fail. Market failure does not mean a market totally collapses or stops existing as a market, but that it fails to provide the socially optimal amount of goods and services. As we will see later, there is one exception: when no goods whatsoever will be provided by private markets. In this section, we will examine market failures that arise from a failure to meet each of the requirements just listed, and suggest some possible solutions.

Accurate Information Is Not Widely Available: Asymmetric Information

One economist tells the story of a friend who for 10 years owned a house near a stream. Neighboring homes were plagued by rats and mice, but not the friend's house. When his neighbors complained about the infestation, the friend would profess never to having seen a rodent in his house. Then, as Todd Sandler tells it, "On the day before he was to sell his house, he was awakened in the middle of the night by a weird sound coming from the attic. Thinking that he would come face to face with his first rat, he went with a flashlight to inspect the attic. When he opened the trap door and stuck in his head, he let out a scream and dropped the light. The 10-year-old mystery had been solved—a large beady-eyed snake stared at him with a rat in its coils."³

This is a perfect example of **asymmetric information**, assuming the friend goes ahead and sells the house without mentioning anything about his rodent control secret. In this case, the seller knows more about the house than the buyer. To some, whether this information should properly be divulged in a real estate agreement is arguable. Some people would be unwilling to live in, or perhaps even purchase, a house in which they knew a snake was loose, while others would be happy know-

Asymmetric information
Occurs when one party to a transaction has significantly better information than another party.

³Todd Sandler, *Economic Concepts for the Social Sciences* (Cambridge: Cambridge University Press), 2001, p. 110.

ing that the rodent problem was solved. For months my uncle would not visit our home because my son's boa was loose in the house.

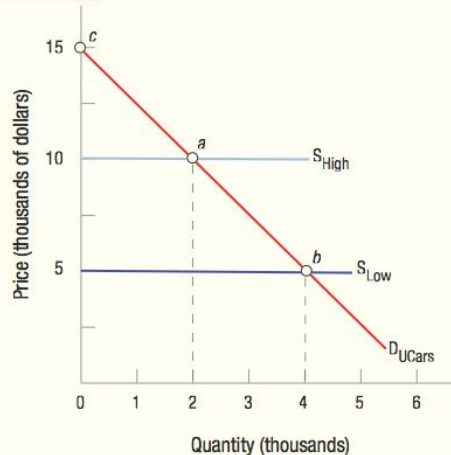
It was suggested earlier that for markets to operate efficiently, accurate information must be widely available. But in many markets, one party to a transaction will almost always have better information than the other. Many buyers at garage sales have more information about the value of antiques being sold than their sellers. My brother-in-law earns a tidy living buying "junk" at weekend flea markets, then reselling it (at greatly increased prices) in his space in an antique mall.

More often, however, it is sellers who have the superior knowledge. Let us consider the used car market, which Nobel Prize winner George Akerlof studied many years ago.⁴ Professor Akerlof wondered why the price of a new car drops so significantly once it is driven off the lot. Put five hundred miles on a car, then list it for sale, and the market price will be 10–20% less than the new-car price.

Let us first look at Figure 2, which assumes that all buyers and sellers have accurate information about used cars. We will divide the market into high-quality cars and low-quality cars, or lemons. For simplicity, we will also assume that sellers are willing to part with high-quality cars for \$10,000 along supply curve S_{High} , and that sellers of lemons are willing to let them go for \$5,000 along supply curve S_{Low} . Demand curve D_{UCars} shows the demand for used cars.

If we assume that the demand curve represents a ranking of consumers based on the prices they are willing to pay for cars, then length ca on the demand curve represents those people who are willing to pay \$10,000 or more for a high-quality

FIGURE 2



The Market for Used Cars

The market for used cars is divided into high- and low-quality cars (lemons). Sellers are willing to sell high quality cars for \$10,000 along supply curve S_{High} , and others will sell lemons for \$5,000 along supply curve S_{Low} . Demand curve D_{UCars} is the demand for used cars. If buyers and sellers have equal information, 2,000 high-quality cars are sold for \$10,000 (point a), and 2,000 lemons are sold for \$5,000 (point b minus point a). When sellers have better information than buyers, buyers cannot distinguish good from bad, so 4,000 lemons are sold at \$5,000 each (point b), and high-quality cars go unsold in the market. To avoid this lemon problem, sellers of high-quality cars will give warranties and use other methods to signal to buyers that their cars are not lemons.

⁴George Akerlof, "The Market for Lemons: Quality, Uncertainty and the Market Mechanism," *Quarterly Journal of Economics*, 1970, pp. 488–500.



George Akerlof



A. Michael Spence



Joseph Stiglitz

Nobel Prize George Akerlof, A. Michael Spence, and Joseph Stiglitz

George Akerlof, Michael Spence, and Joseph Stiglitz won the Nobel Prize in Economic Sciences in 2001 for their ideas on the economics of information, providing important insights into everything from used car sales to insurance to sharecropping.

George Akerlof attended Yale University and earned his Ph.D. in economics from MIT. Shortly after joining the faculty at the University of California at Berkeley, he published "The Market for Lemons," which explored the impact of asymmetric information between buyers and sellers in the used car industry.

In his "Lemons" essay, Akerlof introduced the concept of "adverse selection," which suggested that inadequate information for a buyer might result in an industry-wide selling of low-quality products. Based on his experiences in India, Akerlof explored the impacts of information asymmetries in developing economies. He used the example of rural India, where lenders charged interest rates that were twice as high as those in urban areas. Akerlof laced his economic work with insights from sociology and anthropology, noting, for example, that social conventions like the caste system could have adverse impacts on economic efficiency.

Michael Spence did graduate work at Harvard University, where he studied mathematical economics and equilibrium theory from another Nobel laureate, Kenneth Arrow. In 1971, he began teaching analytic methods at Harvard's Kennedy School of Government.

Spence provided important ideas about how well-informed individuals in a market can "signal" their information to lesser informed individuals to prevent the problems associated with adverse selection. Spence explored the question of education as a signal for participants in the labor markets. He also examined the question of different "expectations-based" equilibria for education and wages.

Joseph Stiglitz attended Amherst College and earned his Ph.D. in economics from MIT in 1967. During the Clinton Administration, he served on the Council of Economic Advisors and was the World Bank's chief economist between 1997 and 2001, resigning after his pointed criticisms of the actions of the World Bank during the Asian economic crisis. In 2001, he joined the faculty of Columbia University.

Stiglitz coauthored a classic paper on how information problems can be resolved in the insurance industry when companies do not have adequate information on the risk situations of their clients. Stiglitz has suggested that economic models may be misleading if they disregard the asymmetry of information between the various actors.